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Morita et al.

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(54) **WORK MACHINE HAVING OPERATION ROD**

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(52) **U.S. Cl.**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,959,879 A * 6/1976 Sellers 30/276
4,748,355 A * 5/1988 Anderson et al. 310/71
5,181,369 A * 1/1993 Everts A01D 34/78
30/276
5,544,417 A * 8/1996 Atos et al. 30/276

(Continued)

FOREIGN PATENT DOCUMENTS

DE 3919952 12/1990
JP S46-014757 Y 5/1971

(Continued)

OTHER PUBLICATIONS

German Office Action, mailed Sep. 1, 2015, by the German Patent and Trade Mark Office for the corresponding German Patent Application No. 102013020192.6 (together with an English language translation thereof).

(Continued)

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(57)

ABSTRACT

A work machine includes an operation rod, a front unit disposed at a front end of the operation rod and configured to attach a tool, a rear unit disposed at a rear end of the operation rod and configured to attach a battery, a brushless motor disposed in the front unit and configured to drive the tool, a motor controller disposed in the rear unit and electrically coupled with the battery, and a plurality of motor power lines disposed along the operation rod and configured to electrically couple the motor controller with the brushless motor.

15 Claims, 4 Drawing Sheets

